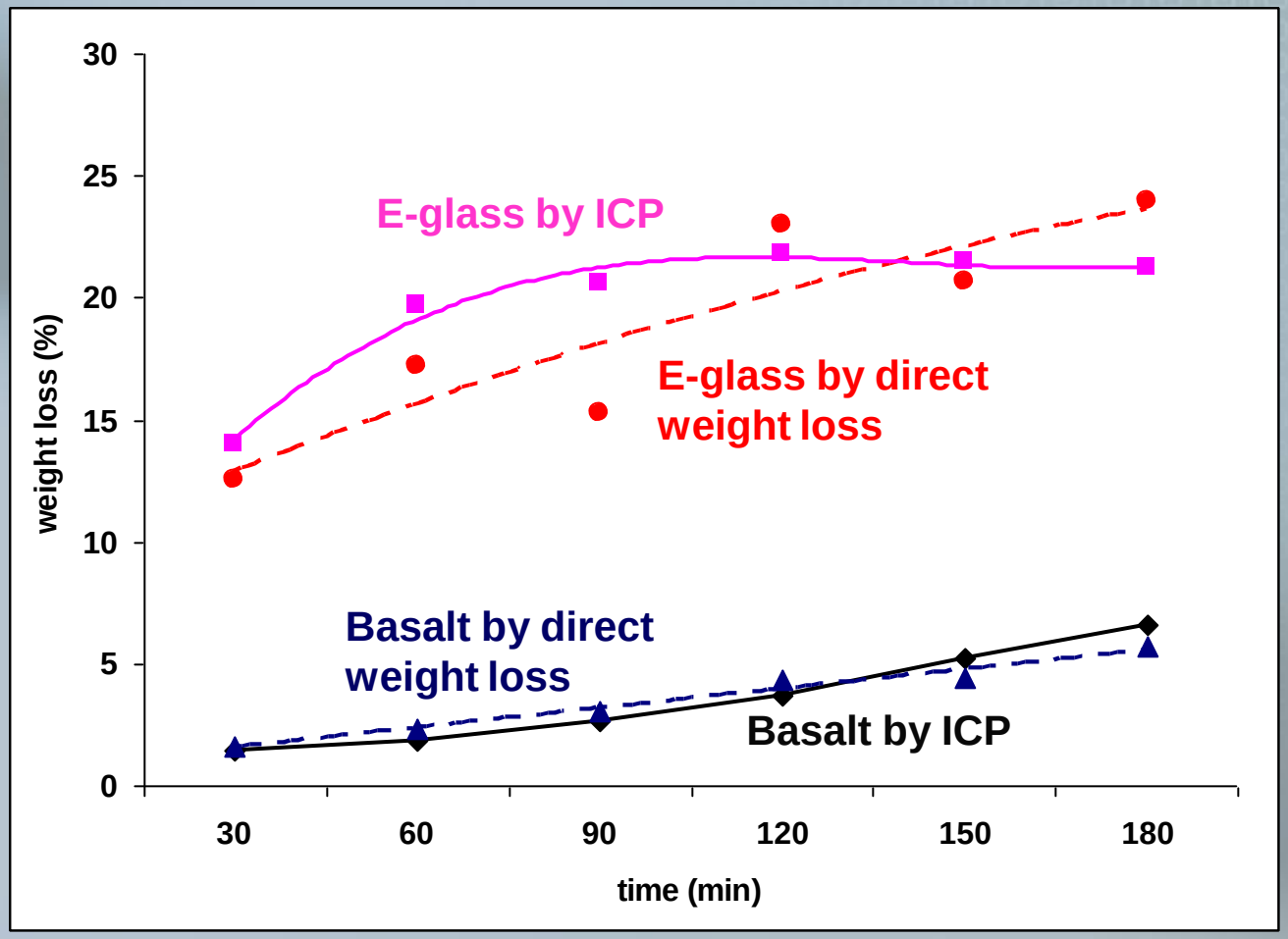
Corrosion resistance of basalt fibers

Investigation Pennsylvania State University
(preliminary report)

Resistance to H_2SO_4

- Weight loss for basalt and E-glass fibers

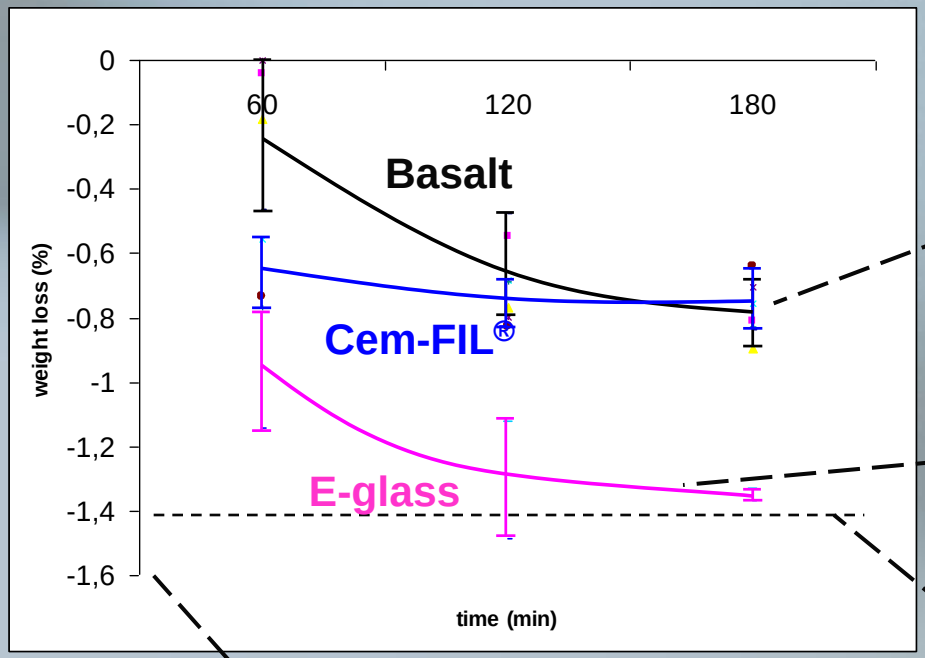


Resistance to H_2SO_4

The resistance of basalt fibers to sulfuric acid is **4-5 times higher** than that of E-glass!

Resistance to cement medium

- Weight loss of basalt, Cem-FIL® and E-glass fibers by ICP



Surface passivation by deposition of Ca salts

Surface passivation is not working for E-glass

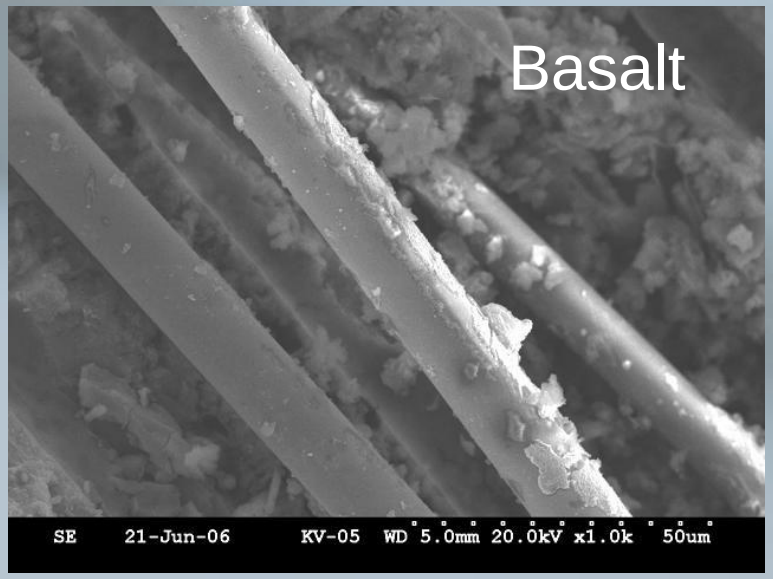
Total Ca amount in solution

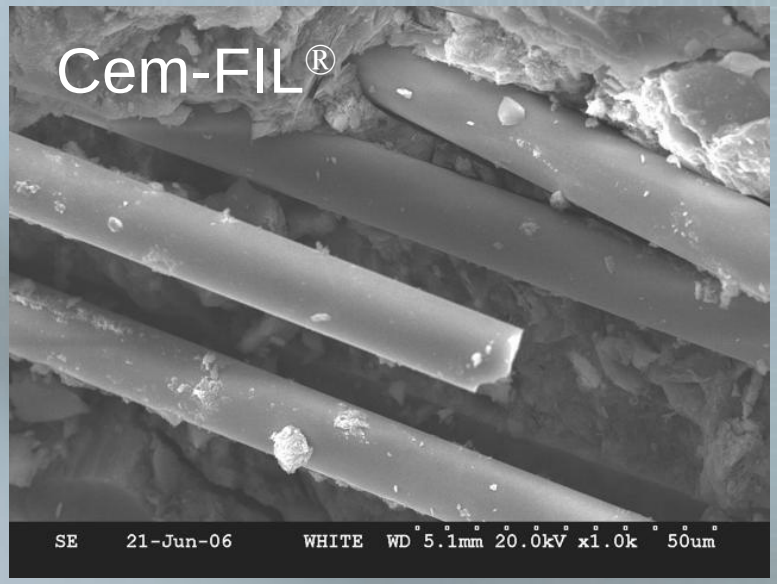
Negative weight loss

Ca salts deposition on fiber surface

Resistance to cement medium

- SEM pictures of basalt and Cem-FIL® fibers in concrete after 28 days of curing





Fiber diameter did not change!

Resistance to cement medium

In cement saturated solution, calcium compounds are deposited on the basalt surface. These presumably passivate the surface to corrosive attack, and yield results which are comparable to Cem-FIL® fibers and 2 times better than E-glass!

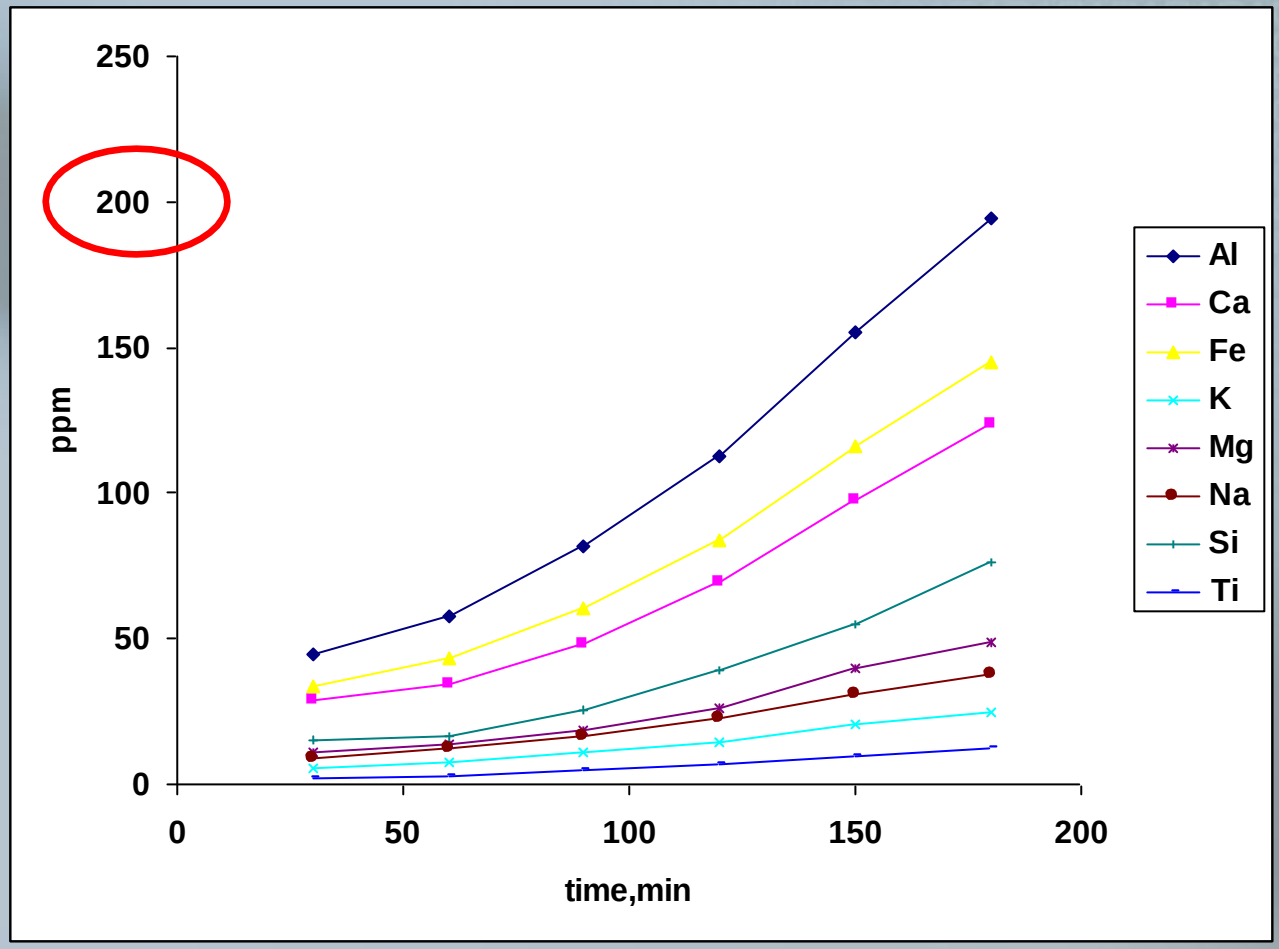
SUPPLEMENT

Methods used

- Fiber dissolution in various corrosive media at 90°C:
  - chemical analysis of the leachate by inductively coupled plasma emission spectroscopy (ICP - Leeman Labs PS3000UV spectrophotometer)
  - Direct measurement of weight loss, and calculated weight loss based on solution
- Scanning electron microscopy of fiber surfaces mechanically extracted from concrete beams

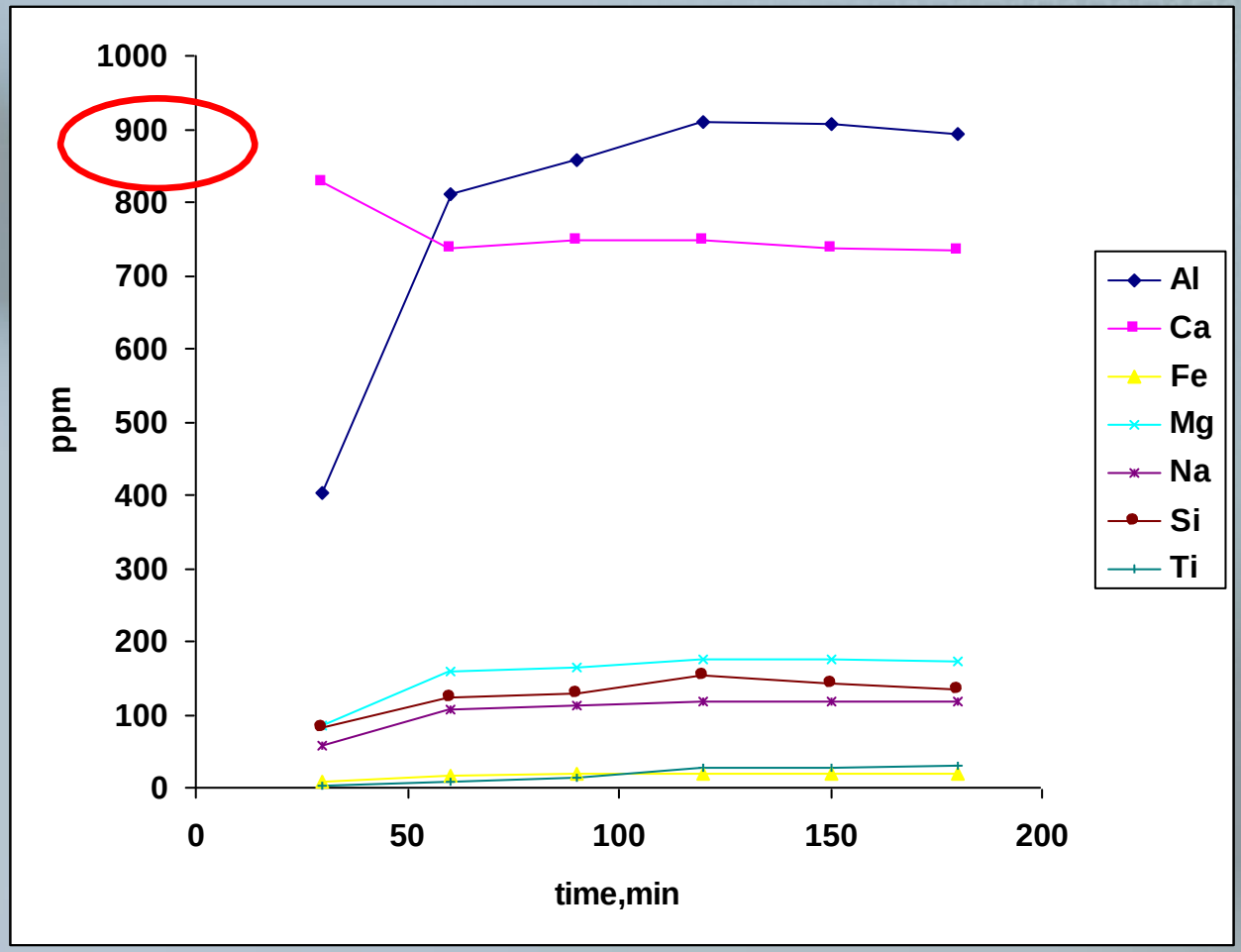
Resistance to H_2SO_4

- Basalt fiber – ion release to solution



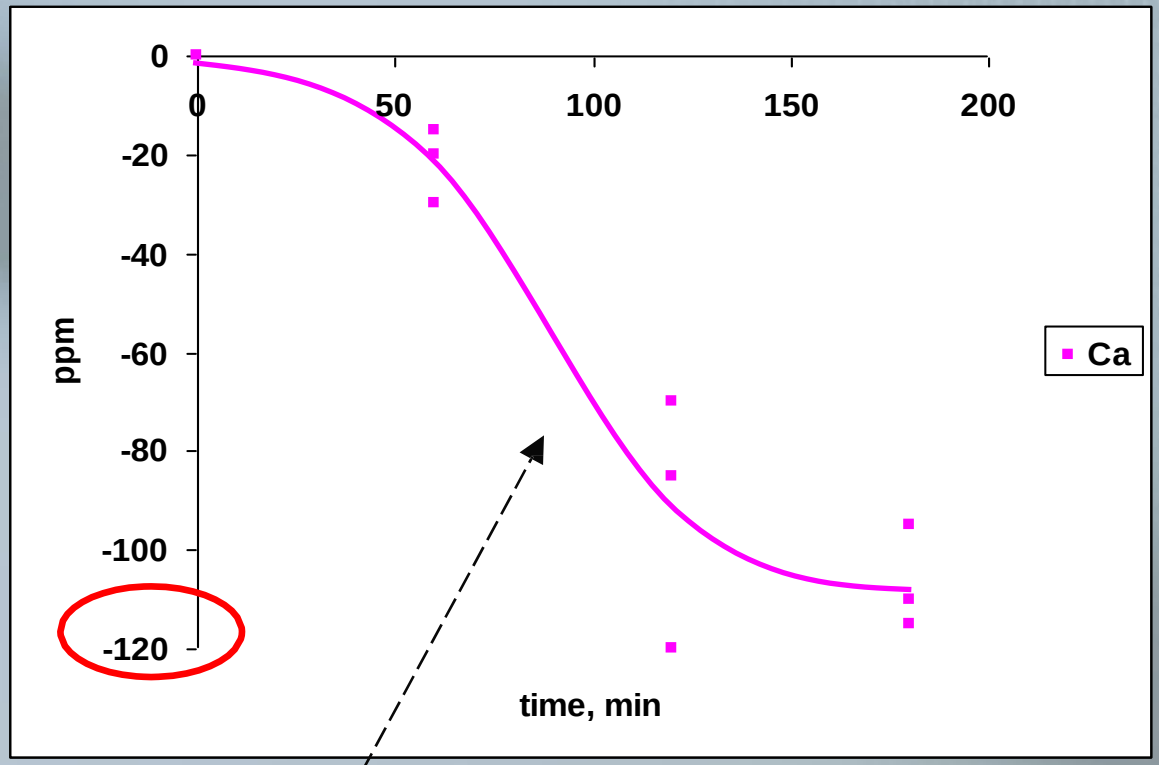
Resistance to H_2SO_4

- E-glass fiber – ion release to solution



Resistance to cement saturated solution

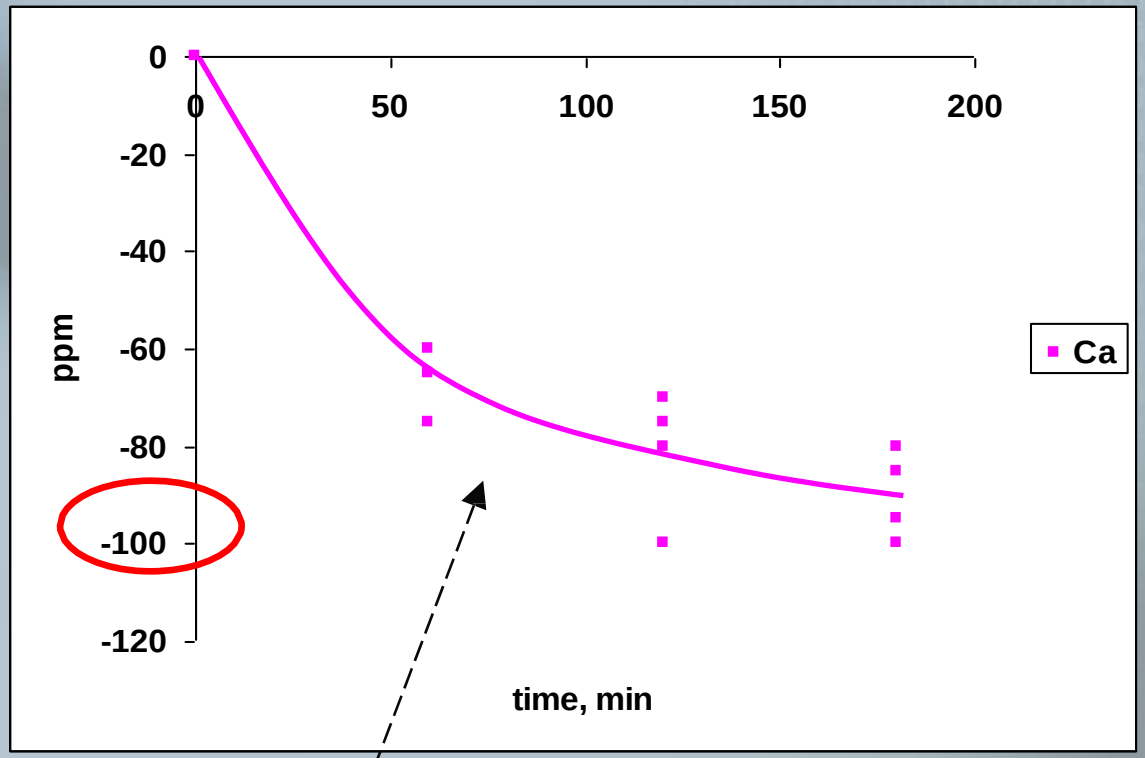
- Basalt fiber – ion release to solution



Ca deposition on fiber surface

Resistance to cement saturated solution

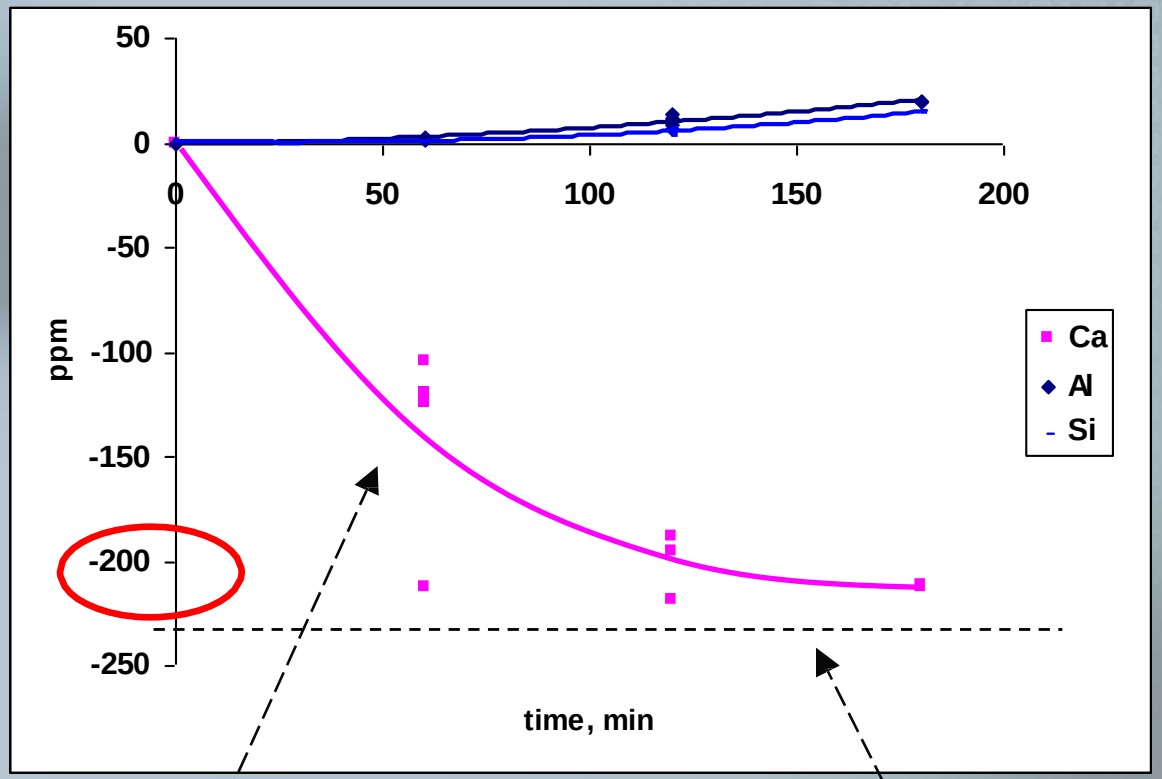
- Cem-FIL® fiber – ion release to solution



Ca deposition on fiber surface

Resistance to cement saturated solution

- E-glass fiber – ion release to solution



Ca deposition on fiber surface

Max amount of Ca ions in initial solution